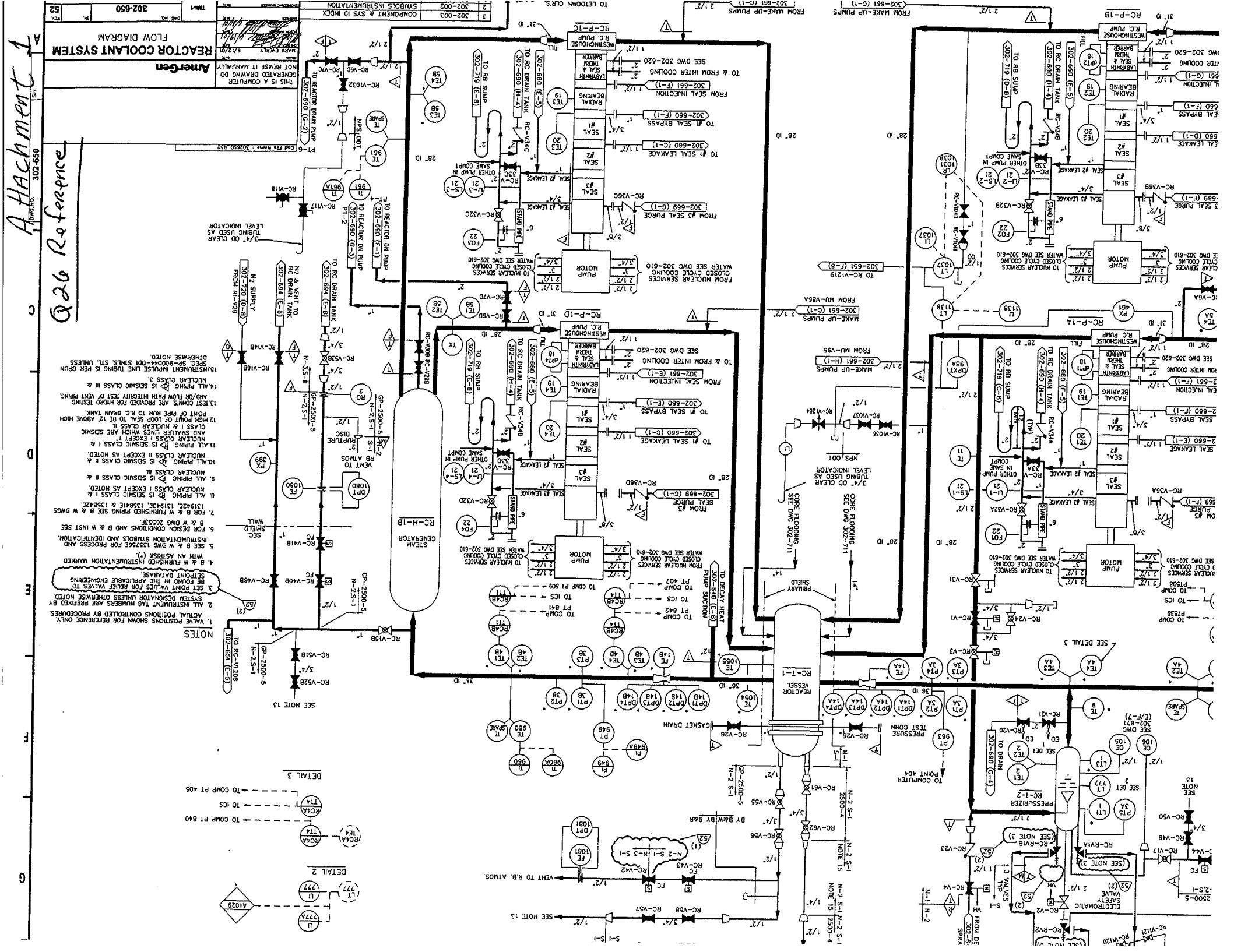
May 19, 2003
NRC SRO Initial License Written Exam
Exam/Answer Key Adjustments

Q	Comment	Resolution	Reference
26	Answer Key identifies D as the correct answer, stating that Pressurizer system failure has occurred. Answer B can also be a credible answer if loss of SI/MU occurs. In order to select answer D, the examinee must assume the Pressurizer system failure. Given that the Loss of MU/SI procedure is included in 3 of the 4 answer choices, assuming loss of MU/SI has occurred is not unreasonable.	**Accept both B and D as correct answers.** With loss of RCP seal injection, seal #2 leak-off would provide a transport flow path to carry high activity RCS water to the RC Drain Tank, even in the absence of a Pressurizer system failure. Even though this bank question was previously approved and used in the 2001 TMI NRC SRO written exam as written, it will be edited in the TMI question bank to preclude 2 correct answers for future use.	**Attachment 1** RCS P&ID 302-650 shows flow path from Seal #2 leak off to the RC Drain Tank.
42	As written, there is no correct answer provided.	**Delete this question** IAW ES-403 Section D.1.b, since there is no correct answer provided. The intent of question was to have two Pressurizer level channels inoperable in excess of 48 hours, to require a Tech Spec shutdown. As written, LI-777 is still operable. Therefore there is no correct answer given. This question will be edited prior to entry into the TMI question bank to represent conditions with both level channels inoperable.	**Attachment 2** TS 3.5.5, Accident Monitoring Instrumentation, and bases, pages 3-40a, 3-40b, and 3-40c. Page 3-40b states LT-1 and LT-3 are common to ONE channel, and that LT-777 is the other channel.
43	Based on the OS-24 definition for "Available as a Heat Sink," Rule 4, FW Control, does not apply.	**Change correct answer from A to D.** Since OS-24 states that a dry OTSG is not considered available as a heat sink, Rule 4, FW Control, does not apply to the conditions in the question stem. Therefore, Guide 13, Dry OTSG, applies. Edit this question prior to entry into TMI question bank: stem should state that both OTSGs are NOT dry.	**Attachment 3** OS-24, Conduct of Operations During Abnormal and Emergency Events, Rev 7, Section 3.9. OP-TM-EOP-010, Abnormal Transients Rules, Guides and Graphs, Rev. 1 – Rule 4, FW Control, and Guide 13, Dry OTSG.
74	Answer Key is not correct.	**Change Answer Key from B to C.** This question was apparently edited, and then answers B and C were interchanged for psychometric considerations. This change brings the Answer Key into conformance with the NRC approved question and discriminant validity statements.	**Attachment 4** Form ES-401-6 for Question #74, as approved by the NRC during week of April 7, 2003, Examiner prep week.

Attachment 1
Q26 Reference



Q-012 Reference
Attachment 2

3.5.5 ACCIDENT MONITORING INSTRUMENTATION

Applicability

Applies to the operability requirements for the instruments identified in Table 3.5-2 and Table 3.5-3 during STARTUP, POWER OPERATION and HOT STANDBY.

Objectives

To assure operability of key instrumentation useful in diagnosing situations which could represent or lead to inadequate core cooling or evaluate and predict the course of accidents beyond the design basis.

Specification

3.5.5.1 The minimum number of channels identified for the instruments in Table 3.5-2, shall be OPERABLE. With the number of instrumentation channels less than the minimum required, restore the inoperable channel(s) to OPERABLE status within seven (7) days (48 hours for pressurizer level) or be in at least HOT SHUTDOWN within the next six (6) hours and in COLD SHUTDOWN within an additional 30 hours. Prior to startup following a COLD SHUTDOWN, the minimum number of channels shown in Table 3.5-2 shall be operable.

3.5.5.2 The channels identified for the instruments specified in Table 3.5-3 shall be OPERABLE. With the number of instrumentation channels less than required, restore the inoperable channel(s) to OPERABLE in accordance with the action specified in Table 3.5-3.

Bases

The Saturation Margin Monitor provides a quick and reliable means for determination of saturation temperature margins. Hand calculation of saturation pressure and saturation temperature margins can be easily and quickly performed as an alternate indication for the Saturation Margin Monitors.

Discharge flow from the two (2) pressurizer code safety valves and the PORV is measured by differential pressure transmitters connected across elbow taps downstream of each valve. A delta-pressure indication from each pressure transmitter is available in the control room to indicate code safety or relief valve line flow. An alarm is also provided in the control room to indicate that discharge from a pressurizer code safety or relief valve is occurring. In addition, an acoustic monitor is provided to detect flow in the PORV discharge line. An alarm is provided in the control room for the acoustic monitor.

Q-042

3.5.5 ACCIDENT MONITORING INSTRUMENTATION (Continued)

The Emergency Feedwater System (EFW) is provided with two channels of flow instrumentation on each of the two discharge lines. Local flow indication is also available for the EFW System.

Although the pressurizer has multiple level indications, the separate indications are selectable via a switch for display on a single display. Pressurizer level, however, can also be determined via the patch panel and the computer log. In addition, a second channel of pressurizer level indication is available independent of the NNI.

Although the instruments identified in Table 3.5-2 are significant in diagnosing situations which could lead to inadequate core cooling, loss of any one of the instruments in Table 3.5-2 would not prevent continued, safe, reactor operation. Therefore, operation is justified for up to 7 days (48 hours for pressurizer level). Alternate indications are available for Saturation Margin Monitors using hand calculations, the PORV/Safety Valve position monitors using discharge line thermocouple and Reactor Coolant Drain Tank indications, and for EFW flow using Steam Generator level and EFW Pump discharge pressure. Pressurizer level has two channels, one channel from NNI (2 D/P instrument strings through a single indicator) and one channel independent of the NNI. Operation with the above pressurizer level channels out of service is permitted for up to 48 hours. Alternate indication would be available through the plant computer.

The operability of design basis accident monitoring instrumentation as identified in Table 3.5-3, ensures that sufficient information is available on selected plant parameters to monitor and assess the variables following an accident. (This capability is consistent with the recommendations of Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant Conditions During and Following an Accident," Rev. 3, May 1983.) These instruments will be maintained for that purpose.

Amendment No. ~~78, 105~~, 242

TABLE 3.5-2

ACCIDENT MONITORING INSTRUMENTS

FUNCTION	INSTRUMENTS	NUMBER OF CHANNELS	MINIMUM NUMBER OF CHANNELS
1	Saturation Margin Monitor	2	1
2	Safety Valve Differential Pressure Monitor	1 per discharge line	1 per discharge line
3	PORV Position Monitor	2	1*
4	Emergency Feedwater Flow	2 per OTSG	1 per OTSG
5	Pressurizer Level	2	1
6	Backup Incore Thermocouple Display Channel	4 thermocouples/core quadrant	2 thermocouples/core quadrant

* With the PORV Block Valve closed in accordance with Specification 3.1.12.4.a, the minimum number of channels is zero.

Q-242

Attachment 3
Q-43 Reference

3.7 LACK OF PRIMARY-TO-SECONDARY HEAT TRANSFER (LOHT) is the inability of either OTSG to remove sensible heat from the RCS. LOHT can be confirmed if :

- Neither OTSG has water level control and pressure control.
  AND
- Core exit temperatures are rising

3.8 MINIMIZE SCM: An intentional reduction of the reactor coolant pressure temperature relationship as close as practical to the 25°F subcooling margin or emergency RCP NPSH limit. (Recommended band 30-70°F)

3.9 OTSG AVAILABLE AS A HEAT SINK:

A physical condition where the OTSG demonstrates level and pressure control, used to determine if primary to secondary heat transfer is possible. (i.e. heat sink) Primary to secondary heat transfer need not be demonstrated to determine this availability. Primary to secondary leakage should not be considered a means of OTSG level control. A dry OTSG is not considered available as a heat sink.

3.10 OVERSIGHT:

The independent monitoring of plant and crew performance and <u>any</u> subsequent intervention, as needed, to ensure the appropriate mitigation strategy is being pursued for the current plant conditions. Refer to Attachment B, SM Oversight Management Guidelines.

3.11 "PLANNED" REACTOR TRIP

A scheduled shutdown, where a reactor trip, is directed by an approved procedure.

3.12 PRIMARY-TO-SECONDARY HEAT TRANSFER (PSHT) is the removal of sensible heat from the RCS to one or both OTSG(s). PSHT can be confirmed if:

- Either OTSG has water level control and pressure control.
  AND
- RCS T_c is approximately the same as secondary T_{sat} and responds to changes in OTSG pressure.
  AND
- RCS forced or verified natural circulation is present.

3.13 RCP AVAILABLE – An available RC Pump is one which can be operated without extraordinary efforts. Pump service functions (motor cooling, seal cooling, etc.) are operable (redundancy not required) and all interlocks can be satisfied. Strict compliance with administrative shutdown criteria (vibration, seal leakoff flow, etc) is not expected when the operation of the pump is more important to safe plant operation.

FWC

4

Rule 4
Feedwater Control

A. **IAAT** the reactor is shutdown, **then:**

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
VERIFY SCM > 25°F.	**MAINTAIN** OTSG level 75 – 85% OPERATING Range Level.
VERIFY at least 1 RCP operating.	**MAINTAIN** OTSG level ≥ 50% OPERATING Range Level.
MAINTAIN OTSG level ≥ 25" STARTUP Range Level.	

B. **If** Level < minimum, **then MAINTAIN** the following MINIMUM required flow:

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
If SCM < 25°F **and** both OTSGs are available, **then FEED** > 215 gpm/OTSG using EFW.	**If** EFW is not available, **then FEED** > 1.0 Mlbm/hr using MFW.
If SCM < 25°F **and** only one OTSG is available, **then FEED** > 430 GPM to the good OTSG using EFW.	**If** EFW is not available, **then FEED** > 1.0 Mlbm/hr using MFW.
If RCPs are OFF, **then FEED** OTSG at maximum available using EFW, within RCS Cooldown rate limit.	**If** EFW is not available, **then FEED** > 1.0 Mlbm/hr using MFW.
There is no minimum required flow rate.	

Guide 13
Dry OTSG

ACTION/EXPECTED RESPONSE	RESPONSE NOT OBTAINED
1. **VERIFY** OTSG SU Level < 6" **and** OTSG pressure at least 200 psi below P_{sat} for T_c.	
2. **MONITOR** Tube to Shell Differential Temperature (TSDT) and **REVIEW** Guide 14.	
3. **VERIFY** the other OTSG is available.	**GO TO** Step 5.
4. **VERIFY** all RCPs are OFF **or** TSDT Limits are being challenged	

NOTE

Automatic EFW actuation is not restricted by this guidance. Limit feedwater flow to the Dry OTSG until OTSG pressure has been restored. RCP operation is desired.

5. **VERIFY** the DRY OTSG pressure boundary is INTACT.	**VERIFY** the OTSG pressure boundary failure is **not** in the Intermediate or Reactor Building.
6. **If** TSDT tensile limit is being challenged, **then,** 1) **If** OTSG pressure boundary is **not** intact, **then VERIFY** an RCP is operating. 2) **FEED** the DRY OTSG at a maximum flow of 0.1 Mlb/HR using Main Feedwater.	**If** RCPs are OFF, **then FEED** the DRY OTSG at a maximum of 185 GPM using EFW.
7. **If** TSDT compressive limit is being challenged, **then,** 1) **If** at least one RCP is ON, **then FEED** the DRY OTSG at a maximum of 435 GPM using EFW.	**If** RCPs are OFF, **then FEED** the DRY OTSG at a maximum of 185 GPM using EFW.

Attachment 4

Form ES-401-6 **Written Exam Question Worksheet** Q # 074

Examination Outline Cross-Reference RO SRO

SYS/EP# 068 KA # K1.07 Page # 3.9-2 Tier # 2

RO/SRO Importance Rating 2.7 2.9 Group # 1

Measurement Knowledge of the physical connections and/or cause-effect relationships between Liquid Radwaste System (LRS) and the following systems: Sources of liquid wastes for LRS.

Proposed Question ☑ RO ☐ SRO ☐ PRA Related **Correct Answer** ~~B~~ C

Plant conditions:
- Reactor power is 100%, with ICS in full automatic.

Based on these conditions, identify the ONE selection below that describes a NORMAL source of water to the Liquid Waste Disposal System.

A. PORV pilot valve leakoff.

B. Leakoff from between the reactor vessel flange O-Rings.

C. Intermittent drain flow from the Waste Gas Compressor Separator.

D. Valve packing leakage from Letdown isolation valves MU-V-1A and MU-V-1B.

Technical Reference 302-696, Waste Gas Compressors Flow Diagram, Rev. 1.

Open Exam Reference None.

Learning Objective IV.B.09.01

Question Source ☑ New ☐ TMI Bank TMI Question #
☐ Modified TMI Bank Parent Question #

Question Cognitive Level ☑ Memory or Fundamental Knowledge
☐ Comprehension or Analysis

10 CFR Part 55 Content ☑ 55.41 .2 to .9 ☐ 55.43 ☑ 55.45 .7/.8

Discriminant Validity Statements

A Incorrect answer.

B Incorrect answer. This line is normally isolated.

C Correct answer. Level switch operates solenoid operated valve to drain excess water from the separator to the Auxiliary Building Sump.

D Incorrect answer. Packing leakoff lines are capped.

Comments None.